Presented at the American Shore and Beach Preservation Association-sponsored National Beach Preservation Conference 2000, August 6-10, 2000, Kaanapali, Maui, HI.

National Shoreline Erosion Control Demonstration Program Overview

William R. Curtis[1] (Phone: (601) 634-3040, Fax: (601) 634-3080, CURTISW@wes.army.mil),
Joan Pope[1] (Phone: (601) 634-3040, Fax: (601) 634-3080, POPEJ@wes.army.mil),
George Turk[1] (Phone: (601) 634-2332, Fax: (601) 634-3080, TURKG@wes.army.mil)

[1]US Army Engineer Research and Development Center, Coastal and Hydraulics Laboratory, 3909 Halls Ferry Road, Vicksburg, MS 39180

The National Shoreline Erosion Control Development and Demonstration Program of the US Army Corps of Engineers was established by Section 227 of the US Water Resources and Development Act (WRDA) of 1996 with initial funding appropriated in FY00. Section 227 provides a means by which the Corps can evaluate the functional performance of innovative or non-traditional approaches for abating coastal erosion and improving shoreline sediment retention at prototype-scale. A wide array of shore protection devices and methods will be constructed, monitored and evaluated at sites that represent varying energy conditions and shoreline morphologies. This program builds upon the experience and lessons of the "Low Cost Shore Protection Demonstration Program (Section 54)" of the 1970's. The Section 54 Program, authorized by WRDA 1974, focused on testing technologies for survivability in "low-wave energy" environments (USAE 1981).

Objectives of Section 227 are to assess and advance the state of the art of shoreline erosion control technology, encourage the development of innovative solutions to the shoreline erosion control challenge, and to communicate findings to the public. Through an extensive technical transfer effort, the Program will provide a means for furthering the use of well-engineered alternative approaches to shoreline erosion control. Emphasis will be placed on the evaluation of technologies from both functional and structural perspectives and will include bioengineered approaches.

Section 227 states that a minimum of seven demonstration projects will be constructed on various coastlines: two on the Atlantic coast, one on the Gulf Coast, two on the Pacific coast, and two on the Great Lakes. Project locations must be experiencing shoreline erosion at a manageable rate and have sufficient shoreline length to demonstrate the functional performance of the technology selected for testing at that site. Additionally, sites must have suitable control sections or pre-project monitoring records, and have identifiable spatial and temporal scales associated with localized coastal processes.

In addition to constructed demonstration sites, the program will also take advantage of "targets-of-opportunity" to monitor sites where innovative shore protection approaches may be installed through the sponsorship of others. That is, a site where another Federal or non-Federal organization has implemented an approach which shows engineering promise, but is not in a position to properly monitor or document project performance. The program will also sponsor the development of a database that documents installations and case example reports.

Selection criteria for demonstration technologies include applicability to project site, suitable and quantifiable performance prediction metrics, sound engineering design, and economic feasibility of construction and maintenance. Specific technologies identified as having a high priority for testing include groin configurations and permeability, reef breakwaters and breakwater configuration, armoring alternatives, bioengineered and vegetative approaches, cohesive and bluff shore treatments, and other sand retention methods and site management strategies. All demonstration projects must meet local permitting and regulatory requirements.

Nominations for demonstration sites and technological applications are being coordinated through the USACE coastal District and Division offices. The Section 227 oversight committee; consisting of the Civilian members of the Coastal Engineering Research Board, USAE Headquarters and ERDC staff; reviewed the 37 submitted site nomination packages and identified

Report Documentation Page

Form Approved
OMB No. 0704-0188

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE **AUG 2000**	2. REPORT TYPE	3. DATES COVERED **06-08-2000 to 10-08-2000**
4. TITLE AND SUBTITLE **National Shoreline Erosion Control Demonstration Program Overview**		5a. CONTRACT NUMBER 5b. GRANT NUMBER 5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)		5d. PROJECT NUMBER 5e. TASK NUMBER 5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Army Engineer Research and Development Center,Coastal and Hydraulics Laboratory,3909 Halls Ferry Road,Vicksburg,MS,39180**		8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSOR/MONITOR'S ACRONYM(S) 11. SPONSOR/MONITOR'S REPORT NUMBER(S)
12. DISTRIBUTION/AVAILABILITY STATEMENT **Approved for public release; distribution unlimited**		
13. SUPPLEMENTARY NOTES		
14. ABSTRACT		
15. SUBJECT TERMS		

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**		**4**	

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std Z39-18

sites appropriate for further development. Technological advancements will be selected for demonstration based on scientific and engineering validity and economics. Performance of the applied technologies will be evaluated as related to interaction with the coastal system and other engineering considerations such as constructability, structural stability and life-cycle cost. Evaluation of functional performance will be documented and widely disseminated to the coastal engineering community.

Based on availability of fiscal year 2000 funding, four sites were selected for project implementation plan development. The first of these four sites, located in the borough of Cape May Point, New Jersey was specified in the appropriations language of Section 227. Cape May Point is a 1.8 km long beachfront community located on the southern tip of New Jersey. Cape May Point is particularly vulnerable to storm damage due to exposure to waves from both the Atlantic Ocean and the Delaware Bay. Wave heights average 0.6 m in the summer and 1.2 m in the winter with much higher waves occurring during storms. The mean tide range is 1.2 m. Net longshore sediment transport is predominantly wave induced and is directed from east to west with an average transport rate on the order of 152,920 cubic meters per year. Existing shore protection structures along the shoreline at Cape May Point include a series of nine groins at ~150-300 m spacing and a rubble revetment armoring the shoreline in the easternmost groin cell (Figure 1A). While these engineered efforts have "held-the-line" in most shoreline sections with regard to erosion, that "line" is at a critical position. There is virtually no buffer from storm events, which can severely damage the area, and also contribute saltwater intrusion of a critical freshwater wetland.

The compartmentalized beach at Cape May Point presents an opportunity for researchers to evaluate the effectiveness of narrow-crested submerged breakwaters and sills to retain sediment on the active beach profile. In cooperation with the State of New Jersey Department of Environmental Protection, a project implementation plan is being developed that will consist of construction of continuous breakwaters and sills across selected groin compartments in an effort to retain beach fill material. An assessment will be made to determine the effectiveness of these structures when used to extend the renourishment interval by retaining sand on the active profiles contained in the groin cells.

The second demonstration site to be initiated this year is located on the Gulf Coast in Jefferson County, Texas, about 50 km west of the Texas-Louisiana border. The beach is representative of beaches of the western Gulf Coast, which vary in texture and composition from mud or thin sand veneer over mud with high concentrations of caliche nodules and shell material to dominantly sand with minor shell material. Typical topography consists of a relatively flat-sloped nearshore, a relatively steep beach, and a wash over terrace. The elevation of this wash over terrace, which is the highest point on the shore, is slightly above normal high tide elevation.

The mean significant wave height is 0.8 m in summer and 1.3 m in winter. Astronomical tides are chiefly diurnal with an average range of 0.4 m. Meteorological conditions strongly affect water levels in the area. Strong winter northers can depress Gulf water levels to nearly 1 meter, and hurricanes can produce storm surges of up to 4.3 m. No previous shore protection work exists in the area.

The principal cause for shoreline recession in the area is storm-related erosion. Under storm conditions, the protective veneer of sand is eroded and the underlying mud beach is exposed to waves for further erosion (Figure 1B). Due to a deficit of sand in the littoral system and storm-related down cutting of the cohesive material, the eroded profile never recovers to its post-storm state. The phenomenon of cohesive profile down cutting is not unique to the western Gulf coast; it also occurs in the Great Lakes and bay environments of the Atlantic and Pacific coasts.

In cooperation with the State of Texas General Land Office, the Jefferson County demonstration site will be designed with two primary shoreline erosion abatement goals in mind: prevention of cohesive bottom down-cutting and prevention of overwash. It is expected that

these goals will be addressed though a combined use of sand and clay-filled geotextile structures, beach nourishment and vegetative methods.

The third demonstration project to begin the design process is Allegan County, Michigan. This shoreline is representative of many in the Great Lakes region. Receding bluffs carved into glacial tills or lacustrine deposits occupy over 60 percent of the shoreline (Figure 1C). Till bluffs exist also along the New England coast, in river valleys, and in countless lakes and reservoirs throughout the northern U.S. and Canada. In coastal scenarios, the blame for most slope movements is commonly placed on toe erosion created by storm waves. Although other factors, notably groundwater, are contributors to slope instability, they are typically considered insignificant when erosion abatement strategies are planned. At this location, receding lake level from the toe of the actively eroding bluff puts groundwater at center stage as the cause of slope instability.

The project area has been monitored for the past four years with respect to slope displacements versus causative factors by investigators at Western Michigan University. Study results demonstrate the significance of groundwater activity as the prime contributor to bluff movements, and that slumps are most prevalent when perched ground water levels are high regardless of wave activity or lake level. Thus, bluff dewatering technology will be evaluated that this location to reduce or eliminate coastal bluff instability. If proven functional, the dewatering of shoreline bluffs will be an inexpensive, non-invasive, and effective method of erosion control.

The fourth full demonstration site to design an implementation strategy this fiscal year is Gilgo Beach, New York. Gilgo Beach is 4.8 km long portion of a barrier beach located on the South Shore of Long Island, New York, between Jones and Fire Island Inlets. Northeasters and hurricanes periodically impact the southern shores of Long Island. These storms produce tides and waves, which cause dune erosion. Offshore wave heights recorded offshore during the December 1992 storm were as high as 9 m. The only existing form of beach erosion control at Gilgo beach is the placement of sand material removed from Fire Island Inlet every two to three years. An engineered berm, with an elevation of approximately 3.6 m above mean sea level, provides protection to a roadway located immediately landward of the beach. Shore protection structures such as timber groins and bulkheads have been destroyed by wave action.

At Gilgo Beach, the New York State Department of Environmental Conservation will serve as a cooperating partner, and three methods of open-coast dune restoration and stabilization are proposed for investigation. The first is the combination of a timber or recycled plastic horizontal lattice structure and dune grass plantings. The concave-shaped lattice structure will be located in the seaward face of the dune. Vegetation will be planted between the plank members. The second method of dune stabilization investigated will be an expandable 3-D sand confinement grid system that is under development for use in inland flood control. The geosynthetic grid cells will provide a protective framework for the engineered dune, and dune grass will be planted within the cells of the structure. Dune restoration via use of recycled glass combined with vegetative plantings will also be demonstrated at this site.

The four demonstration sites will be constructed and monitoring programs initiated in fiscal year 2001. Implementation plans for remaining demonstration sites will be developed with construction targeted for fiscal year 2002. The performance of all demonstration projects will be monitored under the Section 227 Program for a minimum of three years. Additional information regarding the National Shoreline Erosion Control Development and Demonstration may be accessed via the Internet at http://chl.wes.army.mil/research/cstructures.

References

US Army Corps of Engineers (1981). "Low-cost shore protection", Final Report on the Shoreline Erosion Control Demonstration Program (Section 54)", US Army Corps of Engineers, Washington, DC.

Presented at the American Shore and Beach Preservation Association-sponsored National Beach Preservation Conference 2000, August 6-10, 2000, Kaanapali, Maui, HI.

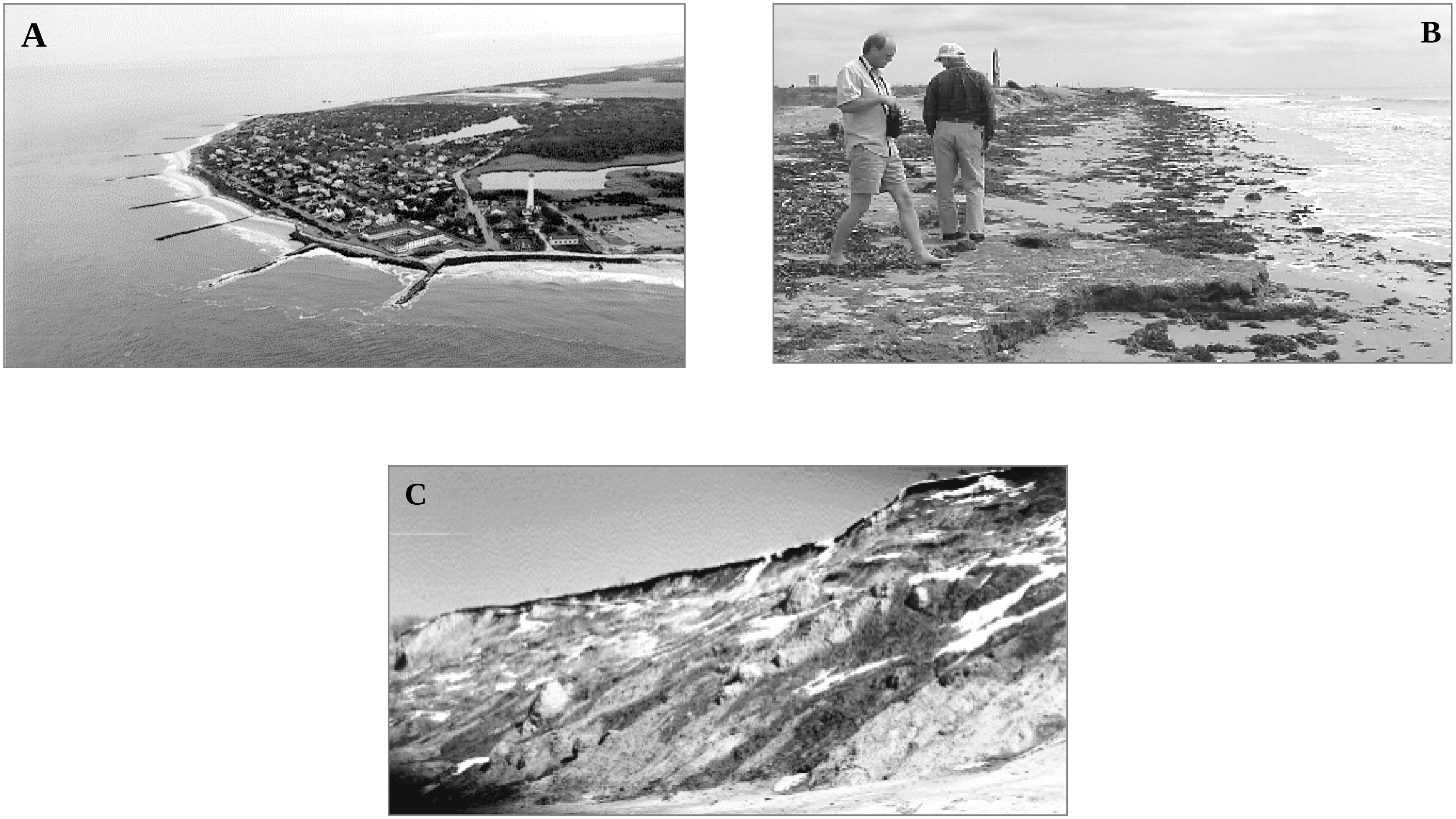

Figure 1. **(A)** Groin compartments at Cape May Point, NJ. **(B)** Eroded cohesive layer outcrop at Jefferson County, TX. **(C)** Frozen perched groundwater seeps in coastal bluff at Allegan County, MI.